date or process for the cessation of NTSC broadcasts seem to vary widely, there actually is more consensus than meets the eye.

The Broadcasters (at 26) point out that they have strong incentives to complete the transition as soon as possible to minimize the time in which they incur the costs of operating two stations. However, the Broadcasters state it would be folly to set an immutable transition date at this time, arguing that too early a termination would cut off service to those viewers least able to afford the transition. They believe it would be wiser even to defer attempting to set objective benchmarks, but if the Commission does, it should use a benchmark that measures both households and the number of sets capable of displaying ATV, including HDTV, perhaps measured on a market-by-market basis. Several other broadcasters take similar positions.[29]

Some broadcasters take an opposite view. New World (at 8-10) argues strongly to end NTSC on a date certain, and to impose the same discipline on consumers and broadcasters by telling them that NTSC's time is limited. "Broadcasters who quickly make the enormous investment in digital should not have to compete indefinitely against NTSC-only broadcasters, who will have lower costs and a life-or-death incentive to delay or prevent the final transition to digital broadcasts." (New World Comments at *iii*) They view an open-ended or contingent transition timetable as one of the biggest threats to ATV. "Uncertainty of success is implicit in a contingent transition date, and investment -- both consumer and industrial -- loathes uncertainty. The surest way to make ATV fail is to plan for its failure." New World also notes that neither the Commission nor Congress is powerless to modify the transition timetable in the unlikely event that consumers are extremely slow to adopt digital television. Golden Orange also favors a date certain, at least initially, for all broadcasters in

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[29]*See, e.g.*, Pulitzer Comments at 7; Public Television Comments at 23 (benchmark based on sets and households capable of decoding and displaying ATV services); Busse at 4, 6 and Pacific FM at 4 (NTSC transmissions should not cease until the vast majority of TV households are equipped to receive ATV transmissions); WCFC Comments at 11 (any timeline should be a mere guideline, subject to revision).

order to speed the process, saying the date can be advanced or extended until 90% of households have converted.

Many other parties advocate approaches to hasten the end of the transition. The Association of Public-Safety Communications Officials ("APCO") (at 2) argues that without a firm date there would be little incentive for broadcasters, manufacturers and the public to move forward expeditiously, saying that broadcasters have already been sitting on excess radio spectrum far too long. The Utilities Telecommunications Council ("UTC") (at 3) advocates the earlier of a date certain (1/1/05) or an objective benchmark like the availability and use of digital receivers in two-thirds of U.S. households. Motorola (at 6) favors setting a date certain and then moving it forward if circumstances warrant.[30]

Hitachi America (at 4) urges the Commission to establish a timetable and promote it and enforce it vigorously, saying a credible timetable is more important than the specific date. A firm timetable can include milestones like the number of stations transmitting digital signals and the number of households with digital receivers, i.e., receivers or converters for terrestrial, cable, satellite or telco services. Several other parties advocate specific benchmarks, generally based on the number of households that no longer depend exclusively on terrestrial ATV broadcasts.[31] General Instrument (at 5, 13) stresses that consumers must understand there is one transition and it is to HDTV, and also points out the contributions that cable systems will make in lessening consumers' reliance on terrestrial NTSC broadcasts.

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[30] *See also* National Consumers League Comments at 3 (a date certain); ITI Comments at 6 (a rapid transition, less than 15 years, if possible). MAP (at 34) urges the Commission to set a date certain between 5 and 15 years for return of the spectrum, and create a fund, underwritten by broadcasters, to provide digital receivers or converters to those who cannot afford them. WCFC (at 9) proposes a similar federal plan funded through fees on broadcasters. The Grand Alliance opposes such plans. We believe it is neither necessary nor appropriate for government to underwrite or interfere with consumers' investments in digital television appliances.

[31] *See, e.g.,* Thomson Comments at 6; General Instrument Comments at 13; Microsoft Comments at 7. EIA/ATV (at 22) advises the Commission not to fix a date now, but later consider factors like the number of households that rely exclusively on terrestrial NTSC broadcasting, the availability of low-cost digital converters and the amount of ATV programming available.

The extensive comments on this issue, especially the cogent arguments of New World and Hitachi America, strengthen our conviction that the Commission should do everything possible now to hasten and to lend as much certainty as possible to the transition process. Moreover, this conclusion is powerfully reinforced by the strong objections currently being raised outside this proceeding, even by some leaders of Congress, to the plan to lend broadcasters a second channel for converting to ATV. Like many of the comments in this proceeding, these "spectrum giveaway" complaints flow from the mistaken belief that broadcasters are not committed to HDTV or that the transition to ATV will never end, leaving broadcasters with two channels in perpetuity. Nevertheless, establishing an immutable date certain now for the cessation of NTSC broadcasts would be almost as foolish as waiting for the transition to be half complete before beginning the discussion of benchmarks or end dates. We believe the balanced approach we recommended in our Comments (at 10-11) is the prudent course -- establish a specific early target date for the cessation of NTSC broadcasts, and then evaluate it periodically against objective benchmarks and adjust it if necessary.

We also believe that on balance the comments support the proposal in our Comments (at 10) that the Commission adopt a shorter nominal transition period of twelve or even ten years rather than the fifteen years originally contemplated, and that the specific household-based benchmark we proposed for measuring the progress of ATV implementation is the most appropriate choice among many similar proposals.[32] The Commission should not use a benchmark based on the penetration of ATV sets, because such a benchmark would

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[32]"In its intermediate reviews and in its final decision to fix the end of the transition period, the Commission should look at the percentage of households in broadcast reception areas that no longer obtain television service *solely* from over-the-air NTSC broadcasting, including those that have either a digital receiver or a digital-to-analog converter that allows digital broadcasts to be received and displayed on an NTSC set. The Commission should evaluate this benchmark periodically and adjust the "date certain" end of NTSC transmissions--forward or backward--to the point in time where it is projected to be 80 percent. By periodically reviewing the progress of implementation against this benchmark, the Commission should be able to fix a final date certain upon which NTSC transmissions will cease, giving two or three years of advance notice. This will give the relatively few viewers who still remain dependent on over-the-air NTSC broadcasts ample time either to obtain ATV receivers or converters or to subscribe to another television service. It will also give broadcasters and manufacturers time to make final plans for the end of the transition." (Grand Alliance Comments at 10)

significantly overstate consumer reliance on NTSC broadcasts. Many years after consumers no longer depend on terrestrial NTSC broadcasts, they will still be able to use NTSC sets in a variety of ways, e.g., to receive broadcasts through cable systems or other nonterrestrial delivery media, to play video tapes and video games, or to receive terrestrial ATV broadcasts by using an ATV-to-NTSC converter.[33,34]

Application/Construction Deadlines

One of the best ways to facilitate an earlier end of the transition is to start it sooner. To this end, in our Comments (at 13) we urged the Commission to shorten the application and construction schedule, especially for broadcasters in the 25 largest markets. Similarly, Motorola, Thomson and General Instrument endorse shorter application and construction periods.[35] General Instrument (at 16) also points out that consistency is vital in providing manufacturers with incentives to develop hardware, and urges the Commission to consider incentives to encourage early construction by broadcasters.

In contrast, the Broadcasters (at 15) support a market-staggered construction schedule, a liberal waiver policy, and a grace period for small commercial and noncommercial stations. NAB (at 6) also favors a staggered approach: six years for markets 1-10; three years more for the next tier; and an additional three years for broadcasters in the smallest markets. The Association of Federal Communications Consulting Engineers ("AFCCE") (at

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[33]Using "the number of sets capable of displaying ATV, including HDTV" as a benchmark , as proposed by the Broadcasters (at 26), would be especially inappropriate if this means sets that display full high-definition resolution. As discussed in Section XI of these Reply Comments, although all ATV receivers should *receive* all ATV formats, including HDTV, some consumers may prefer less expensive ATV receivers that *display* HDTV signals in a lower resolution.

[34]In his *En Banc* Hearing Statement (at 6), Sherwin Grossman, President, Community Broadcasters Association ("CBA"), urges the Commission to pick a date or range of dates on which all full-power and low-power broadcasters would convert simultaneously to ATV on their existing channels, and consumers would all buy ATV receivers or converters in anticipation of the change. This proposal is completely impractical for a variety of reasons, including the fact that manufacturers rely on early adopters to build product volumes that permit costs to be driven out of later generations of their consumer electronics products.

[35]Thomson Comments at 8 (shorter period for 25 largest markets); Motorola Comments at 8 (six years is excessive, three appears adequate); General Instrument Comments at 16 (three years for major markets, up to six for smaller markets). EIA/ATV (at 21) favors date-certain application and construction deadlines with special consideration given to noncommercial and small-market broadcasters.

8-9) fears that six years may be inadequate due in part to limited capacity in the existing broadcast equipment industry. On the other hand, New World (at 9) argues strongly for a firm construction deadline, saying how strictly it's enforced is more important than how long it is. New World also stresses that broadcasters who make the investment should not have to subsidize those who don't, and there should be no rewards for voluntarily failing to construct.

The Grand Alliance supports those parties calling for an accelerated application and construction schedule, at least for broadcasters in the largest markets. Furthermore, we oppose the proposals for liberal waivers or for extended periods for some broadcasters. The NAB proposal is particularly inappropriate in that under its terms, many broadcasters would not even begin to offer ATV until twelve years after a channel was assigned, unacceptably delaying the end of the transition and the recapture of valuable spectrum. With such an extended constructioin schedule, the Commission would face great pressure to make the ATV spectrum available to other entrants or for other purposes, and would have great difficulty justifying its finding that the rapid introduction of ATV would be best served by limiting initial eligibility to existing broadcasters if it simultaneously found that many broadcasters could wait twelve years before even beginning the transition.

Moreover, we believe that the concerns of AFCCE regarding the ability of the broadcast equipment industry to support the conversion to ATV are greatly overstated. First, it is shortsighted to assume that industry capacity would remain stagnant in the face of a nationwide conversion to ATV. Once the Commission adopts an ATV standard and a clear timetable for the transition, we believe that industry capacity will expand through both existing suppliers and new entrants to meet the demands for ATV broadcast equipment. Indeed, transmitter manufacturers have already been actively involved with the Advisory Committee, the Grand Alliance and others in testing and demonstrating ATV broadcast capabilities, and a variety of implementation activities has already begun with major television networks. Furthermore, as discussed *infra*, a recent major technological advance in transmitter design

promises to ameliorate significantly AFCCE's concerns regarding the ability of broadcasters to use existing tower structures for ATV.

Cost of Conversion

The Broadcasters (at 13) assert that the capital costs of introducing ATV will be from $10 - 20 million per station, and substantially more where new towers and other infrastructure are needed. In his *En Banc* Hearing statement (at 4-8), Ralph Gabbard of NAB estimates the cost of basic ATV pass-through operation at $1.8 million, and the cost for total HDTV operation of $6 million or more. However, these cost estimates were made in 1991 and 1993 based on an analog HDTV system implementation that is no longer relevant. In our Comments (at 14), we offered more current and reliable estimates of the costs for basic HDTV pass-through operation ($1.1 million), basic HDTV operation including local news production ($1.4 million), and total HDTV conversion including full-blown high-definition studio capability ($6 - 8 million). We also pointed out that the investments for total HDTV conversion can be made over a period of years as part of the regular capital budget with only a modest incremental investment over current requirements.

Since we made these estimates, a major advance in the technology of power amplifier design using silicon carbide transistors has made possible a transmitter which is a fraction of the size, weight and cost of existing products. In addition to the direct transmitter cost savings, the reduction in size and weight means that the transmitter and the antenna can be mounted as a single unit on the tower itself, avoiding the need for the present six-inch feed line, typically 1,000 feet long, and reducing or eliminating the need for structural reinforcement of the tower. Consequently, the estimates contained in our comments can probably be reduced by approximately $250,000, and are likely to fall further over the next several years. Furthermore, it's even more clear now that costs for digital studio equipment

are falling, with digital HDTV cameras coming to market priced just ten percent above NTSC cameras, and with digital video tape recorders priced on a par with analog VTRs.[36]

These updated cost estimates are good news for broadcasters who must invest considerable sums to make the conversion to ATV/HDTV. They also offer assurances that the Commission can confidently promote a more rapid application, construction and transition process without unduly burdening broadcasters.[37,38]

IX. The Commission should recover spectrum as soon as possible in large, contiguous, nationwide blocks.

In our Comments (at 11-13), we urged the Commission in making ATV channel assignments to look ahead to the recovery of one of each broadcaster's 6 MHz channels at the end of the transition period. We also urged the Commission to repack the ATV spectrum once NTSC transmissions ceased, explaining that with careful planning now, the Commission will be able to recover more spectrum that can be organized into large, contiguous, nationwide blocks that will be far more valuable than a patchwork quilt of locally available spectrum.

There is widespread support for this approach among broadcasters and other commenters, including the suggestion that the cost of repacking moves at the end of the transition be paid by the new users of the spectrum or from the proceeds of any auctions used

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[36]R. L. Stow, RUPERT STOW ASSOCIATES, "Capital Cost Estimates for the Transition to Digital Broadcasting," January 8, 1996. (Mr. Stow was also the co-author of the study published in 1993 upon which NAB bases its estimates.)

[37]WCFC (at 10) mistakenly assumes that ATV transmitters must always be separated from NTSC transmitters. In fact, it is not only feasible, but ideal, to collocate the transmitters on the same tower wherever possible.

[38]In his *En Banc* Hearing statement at 2, Steven Rattner of Lazard Freres opines that "investors are most interested in the opportunities for multiplexing and new communications services since it is hard to see how HDTV alone will generate sufficient additional revenue to fund major capital expenditures." Similarly, in his *En Banc* Hearing statement at 12-13, Ralph Gabbard of NAB states that ATV will offer no increased revenues in small and medium markets to support payments on additional loans to finance the conversion to ATV. First, as we demonstrated in our Comments (at 15), HDTV does in fact present broadcasters with opportunities for additional revenues. Second, it seems remarkable that Mr. Rattner did not comment on the business case for broadcasters if their cable, wireless cable, satellite and telephone company competitors implement HDTV and they are left with a technically inferior service.

to reassign the recovered spectrum.[39] In the course of supporting rapid spectrum recovery, several commenters make specific suggestions.

Motorola (at 2-8) urges the Commission to take steps up front to ensure that usable spectrum is recovered as soon as possible, to make spectrum recovery an absolute requirement of an ATV license, and to accelerate various aspects of the process. They also ask the Commission to identify now contiguous blocks of television spectrum within which ATV allotments will not be made.

Saying that no other FCC-regulated service comes close to broadcast television's level of spectrum inefficiency, UTC (at 5-9) applauds the opportunity that digital television brings to rectify this situation. They favor creating large nationwide contiguous blocks of recovered spectrum, and urge the Commission to commence a proceeding to designate this as a spectrum reserve for new and emerging technologies, including private radio. They believe this "VHF reversion spectrum" will be ideal for meeting the needs of utilities and public safety, and suggest that new entrants could be allowed to negotiate with incumbent VHF broadcasters regarding early entrance to the band in return for compensation to fund the broadcasters' conversion to ATV.

EIA/ATV (at 25-26) urges that contiguous spectrum be recovered as soon as possible, and suggests that the Commission consider incentives to speed the process, like charging "rent" in the form of spectrum fees to those broadcasters who continue to use NTSC spectrum beyond a certain point in the transition period.

We agree with Motorola that the recovery of one channel should be an explicit condition of any ATV license. We also encourage the Commission to explore mechanisms such as those proposed by UTC and EIA/ATV to hasten the recovery and reassignment of television spectrum.

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[39]*See, e.g.*, Broadcaster Comments at 29; Public Television Comments at 25; Golden Orange Comments at 3; ITI Comments at 7; Ameritech Comments at 5; Zenith Comments at 2; Thomson Comments at 4, 7; General Instrument Comments at 15; PCIA Comments at 10; APCO Comments at 2 (reallocate some returned spectrum to public safety land mobile operations).

X. ATV spectrum auctions are unwarranted if the predominant use is for free television with HDTV as the primary application.

Proceeding from the misconception that broadcasters have forsaken HDTV, several commenters urge the Commission not to assign ATV channels to existing broadcasters, but to auction the ATV spectrum to the highest bidder. MAP (at 17) argues that the ATV spectrum must be auctioned unless it is used principally for free over-the-air TV. ACM (at 12) urges the Commission not to "give incumbent broadcasters a $70 billion Christmas gift," but to require them to pay for the spectrum they receive either through auctions or a variety of other means. In her *En Banc* Hearing statement (at 3), Faye M. Anderson of Douglass Policy Institute argues that digital broadcast spectrum should be auctioned to the highest bidder with no special preferences given to existing broadcasters. Applauding Congress for ordering the FCC to rethink its licensing scheme, she asserts that the transition period will be much longer than 15 years and won't end until there is 100% penetration of digital sets, and that allocating broadcasters 12 MHz indefinitely is the biggest corporate welfare giveaway of the decade. The Small Business Survival Committee ("SBSC") (at 1) also urges that the ATV spectrum be auctioned, expressing similar sentiments.[40]

In contrast, Edward T. Reilly (*En Banc* Hearing statement at 3) states that auctions would change the face of over-the-air broadcasting and bias the whole system toward subscription services, while Richard E. Wiley, Chairman of the Advisory Committee, (*En Banc* Hearing statement at 3) argues that with auctions, HDTV, if developed at all, would become a premium, subscription service, offered only by cable and DBS providers, and that it would be far better to auction returned spectrum at the end of the transition. New World (at *ii*, 11) sees ATV spectrum auctions as the biggest threat to building a free, competitive, over-

[40]Although FAIR (at 1) and the approximately 27 individuals who wrote letters taking the same position oppose assigning ATV channels to incumbent broadcasters, they strongly oppose using auctions to assign ATV channels, saying this would simply assure that more well-financed corporations, like phone and cable companies, would be able to take over a large chunk of the airwaves.

the-air digital broadcast system. Many other commenters strongly oppose proposals to auction the ATV channels.[41]

In our Comments (at 11, fn. 2), we addressed recent legislative proposals aimed at reducing the federal budget deficit by requiring the Commission to auction the ATV spectrum. We stated that such proposals would not only render broadcast ATV stillborn and undermine the ability of free over-the-air television to compete technically in the decades to come, but would lock in an inefficient usage of scarce spectrum and grossly reduce the funds that ultimately could flow to the U.S. Treasury by auctioning recaptured television spectrum at the conclusion of the transition to ATV.[42] Moreover, many of those proposing to auction the ATV transition channels mistakenly believe that this spectrum is readily usable for almost any purpose.[43] In fact, without years of additional development and testing, these slivers of spectrum interspersed among existing NTSC television channels can only be used for one-way digital point-to-multipoint broadcast applications using appropriate layers of the Advisory Committee's proposed ATV standard or something very similar.

The commenters in this proceeding who advocate that the ATV channels be auctioned do so under the premise that broadcasters are not committed to free over-the-air television or to upgrading their service to HDTV. As the preponderance of comments shows, this premise is false, and once again the Commission can put this controversy to rest by adopting policies to ensure that broadcasters follow through on their commitment to use the ATV channel predominantly for free television with HDTV as the primary application.[44]

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[41]*See, e.g.*, National Consumers League Comments at 3 and IBEW/IUE Comments at 4 (would delay or kill ATV/HDTV); PCIA Comments at 9; EIA/ATV Comments at 20 (would spell the death knell of free over-the-air broadcasting); Thomson Comments at 7 (would render ATV stillborn and lock in an inefficient usage of television spectrum); General Instrument Comments at 15 (Commission should auction recovered spectrum after the transition, otherwise the dramatic increase in value from repacking would be forfeited); Busse Comments at 3 (small broadcasters would be unable to bid successfully for the ability to continue to serve their markets); Pacific FM Comments at 2; Statement of Ralph W. Gabbard, NAB, *En Banc* Hearing, at 18 (would stymie the deployment of free advanced television service).

[42]*See also* Statement of James E. Carnes, Grand Alliance, *En Banc* Hearing, at *ii*, 9.

[43]*See, e.g.*, SBSC comments at 1.

[44]George A. Keyworth of Progress and Freedom Foundation suggests that digital TV spectrum and existing analog spectrum be sold as real property, with operational freedom -- within the bounds of antitrust law and

XI. The Commission need not mandate requirements for the consumer electronics equipment necessary to support the introduction of digital television.

In our Comments, the Grand Alliance explained why it is not necessary, and in many cases would be very harmful, for the Commission to mandate requirements on the consumer equipment necessary to bring about a rapid introduction of digital television, including HDTV. A number of other parties propose a variety of requirements for such equipment, and while it is gratifying to see this further evidence of a commitment to a rapid transition to ATV and HDTV, nevertheless, in most cases it would be harmful to consumers and counterproductive to the Commission's goals to adopt these requirements.

Specifically, in our Comments we stated our belief that all set manufacturers will build digital receivers that *receive* all ATV formats, including HDTV, without any FCC requirement to do so, but that different receivers might well offer different grades of *display* resolution, depending on marketplace factors. Even though a mandate is unnecessary, we would support a requirement that all ATV receivers *receive* all ATV formats, including HDTV, provided that it is coupled with a requirement that broadcasters transmit minimum amounts of HDTV programming. We argued strongly, however, that the Commission should not regulate the manner in which the received digital signals are *displayed*, but should rely on marketplace forces, giving manufacturers the latitude to differentiate their products and meet varying consumer needs.

Many commenters appreciate the crucial difference between dictating what signals a television must successfully receive and dictating the formats in which such signals must be displayed. CBS (at 8, fn. 7) aptly notes that it is critically important that all new ATV

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interference considerations -- and with the ability to assign, lease or sell the spectrum. (*En Banc* Hearing statement at 2) This rather vague proposal does not seem to appreciate the need for rather detailed "zoning" specifications to ensure that a given range of frequencies is useful for a certain broad type of service, without destroying the ability of other services in adjacent spectrum to function properly. In any event, this proposal is well beyond the scope of this proceeding and the Commission's regulatory authority, and could not be pursued without fundamental changes in governing law.

receivers and set-top boxes be able to decode all ATV formats, including HDTV, even if the receiver is designed to display the transmitted material only in a lower quality format, thus avoiding "black screens" whenever a program is received with higher resolution than the display capability. HBO (at 15) urges the Commission to require all ATV sets to receive (but not to display) all formats. Texas Instruments (at 5) and ITI (at 3) recommend that ATV sets receive all formats, but urge the Commission not to regulate the manner in which such signals are displayed. EIA/ATV (at 17), Zenith (at 4), Thomson (at 8-9) and Hitachi America (at 3) also argue strongly against regulating the manner in which signals are displayed, saying that display modes should be left up to the competitive marketplace and that it's vital for competitors to remain free to differentiate their products. Moreover, EIA/ATV and Texas Instruments argue convincingly that besides being poor policy, the Commission lacks the legal authority to mandate display requirements.

In contrast, The Broadcasters (at 36),[45] Public Television (at 35), and Motorola (at 9) urge the Commission to require all ATV sets to be capable of receiving *and displaying* all ATV formats, including HDTV. It is not clear whether these parties mean that every ATV must be capable of displaying HDTV resolution, or whether they mean, as CBS makes clear, that the ATV screen should never go black. CATA (at 2-3), however, clearly proposes that the Commission should not permit standard-definition-only ATV receivers or even receivers that display HDTV signals as a lower resolution picture.

To the extent that these proposals mean the Commission should require every ATV receiver to be capable of displaying full high-definition resolution, the Grand Alliance strongly opposes them. This would prevent manufacturers from offering receivers with lower-resolution that could receive all digital formats, but would cost substantially less than sets with

[45]The Broadcasters quote a recent speech by Chairman Hundt, in which he stated: "To make digital broadcast a reality, Congress could pass a law requiring all TVs sold after July 1, 1997 to have the capability to receive digital transmission. That would raise the price of TVs less than $100 -- and give us a whole new industry." This statement is misleading because the initial impact on prices would be several times higher than his $100 figure. The less than $100 figure could be accurate for the cost impact many years into the transition, but only after volume sales and cost reductions had driven the price down.

higher-resolution displays.[46] The availability of such sets will be an attractive option for many consumers, including many of more modest means. This is particularly true for smaller-screen models, since consumers may not consider high-resolution displays necessary for some sets used in kitchens, bedrooms or for some other applications beyond the primary home entertainment use. This ability to provide a range of performance capabilities has been extremely valuable to consumers in an NTSC world, and should not be precluded in the ATV world to come. Prohibiting such sets would foreclose valuable options for consumers, would retard ATV market development, and would needlessly prolong the transition to ATV by forcing many consumers to postpone their conversion to digital.[47]

In a similar vein, the Broadcasters (at 36-37), Public Television (at 35), and AFCCE (at 7) urge the Commission to impose minimum standards on ATV receivers with regard to interference and multipath performance. Again, we believe that such regulation by the Commission is unnecessary and could be counterproductive. The Commission can and should rely on competitive marketplace forces -- and on the industry's proven ability to establish voluntary performance specifications -- to ensure that manufacturers offer receivers that provide the performance levels needed and desired by consumers. To the extent that any minimum performance levels need to be established for ATV receivers, they should be the subject of voluntary industry standards.[48]

In another commendable but misguided effort to promote the rapid adoption of ATV, several parties urge the Commission to ban or consider banning the sale of NTSC-only

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[46]Such lower-resolution sets would cost substantially less because even though the decoding electronics would be comparable, the manufacturing cost of high-resolution displays is substantially higher than that of lower-resolution displays.

[47]While recommending against other requirements on receiver manufacturers, Golden Orange (at 4) urges the Commission to require "truth in labeling," i.e., that only the highest resolution displays should be labeled "HDTV." This is an important issue, but one that the consumer electronics industry should solve on its own, without Commission intervention. The industry has successfully addressed similar issues in the past.

[48]*See* EIA/ATV Comments at 13-17, urging the Commission not to prescribe technical requirements for ATV receivers.

receivers after some point in time.[49] As we explained in our Comments (at 17), any requirement to limit or ban the sale of NTSC-only receivers would be particularly ill-advised. During the transition to digital, and perhaps even after, there is likely to be a demand for NTSC-only sets driven by cable services, wireless cable services, direct broadcast satellite services, digital video disc players, and VCRs. Not only will there be sources of NTSC programming available, but there should also be a ready supply of low-cost digital converters that can be used with existing and new NTSC sets to provide many consumers with an initial economical means of accessing digital services.

Just as it was never appropriate or necessary to outlaw black-and-white televisions for the conversion to color to succeed, there is no need to prohibit the sale of NTSC-only sets. Moreover, an artificial requirement to ban NTSC-only receivers could cause severe economic dislocations for television manufacturers and their employees, if NTSC sales were banned before ATV sales had adequately taken hold in the marketplace. Without any intervention by the Commission, the market for NTSC-only sets will atrophy in a natural way over the course of the conversion to digital as ATV becomes predominant.

Similarly, the Commission should reject the suggestion by New World (at 16) that once a date certain for the sunset of NTSC broadcasting has been chosen, the Commission should require every NTSC-only set to come with a prominent warning that it will not be able to receive broadcasts after that date without modifications. As we stated in our Comments (at 17), the success of consumer electronics manufacturers and retailers depends on educating

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[49]HBO Comments at 16, fn. 26 (at some point in the transition period the Commission may wish to address the need to require manufacturers to cease supplying NTSC-only receivers); New World Comments at 15-16 (require manufacturers to make all televisions sold after a date certain capable of receiving and displaying digital broadcast transmission); Motorola Comments at 10 (require all sets larger than 27" sold after 1/98 to be ATV capable, and smaller sets to display ATV signals at standard definition); UTC Comments at 4 (require that as of 1/1/97 all new broadcast receivers be compatible with a digital transmission standard). WCFC (at 7) suggests that "as soon as the new standard is determined, all new television sets should be required to be ATV compatible and to contain the necessary circuits to convert NTSC to ATV." WCFC seems to misunderstand the whole process for converting to digital television. No amount of receiver circuitry can convert analog NTSC transmissions to digital ATV. If it could, the whole simulcast transition process would be unnecessary. *See also,* EIA/ATV Comments at 16 and Thomson Comments at 9 (urging the Commission not to limit or ban the sale of NTSC receivers).

their customers, and the industry can be relied upon to inform consumers and minimize any confusion caused by the process for converting to digital television. Negative labeling would only add confusion to the process.[50]

The Consumer Electronics Retailers Association (at 1), EIA/ATV (at *iii*, 17-18), and Thomson (at 6) oppose the concept floated by the Commission that broadcasters form cooperative arrangements among themselves to lease or otherwise to make ATV receivers and converters available to consumers. No commenters voiced any need for or support of such cooperative arrangements, and the Grand Alliance urges the Commission to drop the idea.[51]

XII. The Commission need not modify the proposed ATV standard to promote interoperability.

Computer Interoperability

In the Notice (at ¶18) the Commission highlights many of the features of the Grand Alliance system that promote compatibility with computer applications and thus enhance its ability to support the NII. In the comments, several computer companies raise concerns about the proposed standard, claiming that modifications should be made before the Commission accepts the recommendation of its Advisory Committee.[52] Although these issues would be

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[50]*See also,* Broadcaster Comments at 36 (the Commission might want to consider warning labels); EIA/ATV Comments at 17 and Thomson Comments at 9 opposing requirements for warning labels.

[51]CATA (at 2) makes a passing reference to "our now non-existent domestic television manufacturing capability," and Harley J. Goldstein (at 4) states "The television industry lacks domestic producers." The Grand Alliance takes umbrage with these erroneous statements and notes that three of its members, Thomson, Philips and Zenith together employ approximately 25,000 people in the United States involved in television design, development and manufacturing. Moreover, the domestic television manufacturing industry includes four additional firms that produce picture tubes and two other firms that produce picture tube glass. Within the last few years the industry collectively has invested or announced plans to invest well over $1 billion in upgrading their television manufacturing facilities.

[52]*See* Microsoft Comments at 2 (barriers to compatibility must be overcome before a standard is adopted); Apple Comments at 4 (the Advisory Committee standard is flawed and must be corrected now); and Computer Industry Coalition ("CICATS") Comments at 4 (notwithstanding the constructive modifications made in response to the computer industry's concerns, CICATS has serious reservations regarding problems for integrating the worlds of computers and television). In contrast, although it favors exclusive use of progressive scan, ITI (a leading computer and information industry trade association) believes that ATV will

more properly raised in the planned separate notice on the proposed standard recommended by the Advisory Committee, we will address these objections here.

Any discussion of interoperability must begin by recognizing that the digital Grand Alliance system and the digital ATV standard recommended unanimously to the Commission by the Advisory Committee represent by far the most interoperable broadcast television system ever conceived. Various subcommittees and working parties of the Advisory Committee have labored long and hard over the past several years to ensure that the proposal maximized interoperability with other media and with computers and telecommunications, and their work and conclusions benefited greatly from substantial input and participation by computer company representatives. Three of the ten criteria used by the Advisory Committee in evaluating ATV proposals related to interoperability. In developing the final specifications for the Grand Alliance prototype system in 1993, first the Grand Alliance members and then the Advisory Committee worked to ensure that the final system incorporated the best interoperability features of the predecessor competitive systems, plus additional modifications that further promoted interoperability.[53] The system's all-digital layered architecture, its packetized data transport structure, its use of headers and descriptors, its support of multiple picture formats and frame rates with a heavy emphasis on progressive scan and square pixels, and its compliance with MPEG-2 international compression and transport standards, give it unprecedented and unmatched interoperability with computers and telecommunications.[54]

Indeed, in May, 1994, approximately 180 participants in the "Advanced Digital Video in the NII" Workshop, sponsored by the Clinton Administration's Technology Policy Working Group ("TPWG"), the National Institute of Standards and Technology, the Electronics

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play an important role in the NII, and urges the Commission promptly to adopt and implement an ATV standard along with policies to stimulate the development of innovative NII applications. (ITI Comments at 2-3)

[53]*See ATV System Recommendation*, Special Panel, FCC Advisory Committee on Advanced Television Service, February 24, 1993, pages 4-4 to 4-5.

[54]*See "National Information Infrastructure and the Grand Alliance HDTV System,"* Technical Subgroup, FCC Advisory Committee on Advanced Television Service, April 19, 1994.

Industries Association, the Institute of Electrical and Electronic Engineers-USA, the Society of Motion Picture and Television Engineers, the Advanced Television Systems Committee, and the Cross-Industry Working Team, recommended rapid adoption of a terrestrial broadcast transmission standard based on the Grand Alliance system, noting the significant contributions the system would make to improving the NII. Subsequently, in January, 1995, this recommendation was approved by the Administration's full Information Infrastructure Task Force ("IITF"), the grandparent committee of the TPWG. The IITF endorsed the report and recommendation of the TPWG which found, *inter alia*, 1) that rapid implementation of advanced digital television is critical to building the future video rich NII, 2) that the Federal Government should fully support the FCC Advisory Committee process and the Grand Alliance's efforts to set an advanced digital television standard, and 3) that the Advisory Committee/Grand Alliance proposal for HDTV is the best available alternative -- "superior to . . . incrementally deploying a system that involves digitizing today's television signals, but not changing the fundamental picture formats and other technical parameters of the current broadcasting infrastructure."[55] These conclusions and recommendations endorsing the Advisory Committee/Grand Alliance approach were made after thorough deliberations of the interoperability features of the proposed HDTV standard.

Moreover, as Richard E. Wiley, Chairman of the Advisory Committee, stated in his *En Banc* Hearing testimony (at 1-2), the interoperability objections raised in these comments are not new. They have been considered and reconsidered and have not withstood the scrutiny of peer review in a consensus driven process. Furthermore, the features of the proposed standard that are the subjects of these complaints are *not* significant barriers to compatibility. Indeed, the Advisory Committee standard abundantly provides features to promote interoperability with computers and telecommunications, yet some in the computer industry

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[55]*See Workshop on Advanced Digital Video in the National Information Infrastructure*, NISTIR 5457, Georgetown University, May 10-11, 1994, and *Advanced Digital Video and the National Information Infrastructure*, Report of the Information Infrastructure Task Force, Committee on Applications and Technology, Technology Policy Working Group, February 15, 1995.

want to *prohibit* features that other industries deem vital. to promote interoperability with systems and equipment used in their industries.

The principal concern raised by these parties is the inclusion of interlaced formats in the proposed transmission standard. (Apple Comments at 5, Microsoft Comments at 4, CICATS Comments at 2, ITI Comments at 3) They argue that interlaced scanning is not sufficient for text or computer generated images, so including such formats will stifle the development of educational, scientific, and other services that seek to incorporate both video images and computer-based information.

In the first place, the Grand Alliance HDTV system emphasizes progressive scan -- five of the six HDTV formats are progressive scan, and the Advisory Committee believes that the lone interlaced format should be "migrated" to progressive as soon as improvements in digital compression and transmission technology make an over-1000 line, 60 Hz progressively scanned format achievable within a 6 MHz terrestrial channel. In addition, all of the HDTV formats, including the single interlaced format, are square pixel formats, an important characteristic for facilitating interoperability with computers. The SDTV transmission formats proposed by the Advisory Committee also stress progressive scan, comprising nine of the twelve SDTV formats.[56] This means broadcasters and others can easily use progressive scan transmission formats for applications that use text and graphics, or for other video that is likely to be viewed on computers.

In the second place, most of these parties confuse transmission formats with display formats that may be implemented in receivers. In a digital system, transmission and display formats are no longer linked and need not be the same. The expressed concerns center around display formats, yet it is the transmission standard and not a display standard that is at issue before the Commission. Some recognize this, but argue that transforming interlaced signals

[56]Thus, 14 of the 18 ATV formats are progressive scan formats. Also, six of the 18 ATV formats are HDTV formats, not just one as stated in Chairman Hundt's November 21, 1995 speech before the International Radio and Television Society.

into progressive signals at the receiver is an imperfect and expensive solution. These concerns are greatly overstated. First, Advisory Committee tests of the Grand Alliance prototype system have conclusively demonstrated that de-interlacer performance is essentially transparent.[57] Second, the cost of receiver de-interlacers was a concern of many parties in the Advisory Committee process until a cost study undertaken by the Advisory Committee concluded that the cost of such de-interlacers would not be an impediment to the rapid adoption of ATV.[58,59]

Finally, although we agree that progressive scan is the better mode for text and graphics material, even if signals *are* transmitted *and* displayed in interlace format, we do not agree that they are inadequate for services involving computer-based information or that using them would stifle such services. Because the computer industry in the past has rendered text and graphics inadequately by not including proper anti-aliasing techniques, interlaced scan has been given a bad reputation. As we demonstrated conclusively at the Commission's *En Banc Hearing* last December, text that is compressed, transmitted, and displayed in interlaced format can deliver good performance.

Ignoring the benefits that interlaced scanning can provide for many types of traditional television programming would unduly limit applications that have proven importance to

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[57]*See* Record of Test Results, *digital* HDTV Grand Alliance System, October 1995, at page III - 45.

[58]CICATS (at 3) questions why computer users should be compelled to bear the cost of de-interlacers, and Apple (at 6) complains that all "computer-compatible" televisions will have to include de-interlacers. These objections ignore the inevitable fact that not all consumers will *want* to pay for a progressive display and de-interlacer. Despite their objections to imposing costs on computer users, these parties wish to mandate progressive scan transmission and displays -- a requirement that would force *all* consumers to bear the greater cost of a progressive scan display, burdening the entire television viewing public with the cost of providing some enhanced interoperability for the sake of computer users.

[59]Perhaps understanding that even if all transmission formats were progressive, some consumers might still find interlaced displays attractive, Apple (at 7) and Microsoft (at 4) call for the Commission to ban interlace formats in all ATV *displays*. This proposal violates a long-standing, widely supported computer industry policy opposing government regulation of the features of consumer electronics products, and is inconsistent with Microsoft's professed belief that "minimal government intrusion is warranted and that the Commission . . . should permit the marketplace to make choices rather than government." (Microsoft Comments at 2) In contrast, CICATS (at 3) and ITI (at 3) limit their call for exclusive use of progressive scan to the transmission standard formats, with ITI (at 4) urging that decisions about how to display received signals be left to the marketplace.

broadcasters and viewers. For example, denied the use of an interlaced format for HDTV, viewers of a sporting event would have to watch the program with either of two inadequacies: 1) at a lower frame rate, resulting in objectionable motion judder during camera pans and fast action; or 2) at a lower spatial resolution, resulting in a loss of clarity and sharpness. In the case of SDTV, denying the use of interlaced formats would either incur one of these two penalties or would reduce the number of programs that could simultaneously be carried over the channel. Interlaced scanning enhances spatial resolution at a modest compromise in temporal frame rate. While interlace scanning may not be optimum for computer text and graphics applications, it has a long track record of proven value and successful use in traditional television broadcasting, and has many staunch defenders. In addition, broadcasters must be concerned about the interoperability of an ATV transmission standard with currently available HDTV production equipment and with the installed base of NTSC production and studio equipment, virtually all of which employ interlaced scanning.

In evaluating pleas to ban interlaced transmission formats from the ATV standard, the Commission must bear in mind that with today's technological limitations such an action would mean that a 720 line progressive format would be the dominant format for HDTV live video programs. There is a substantial body of broadcasters and others who believe that a high-definition format must have more than 1,000 lines to be successful. Any action to eliminate the 1080 line interlaced HDTV format from the proposed standard would cause a substantial loss of industry support for the overall ATV proposal.[60] Moreover, it is ironic that the proposed U.S. ATV standard is the only digital television development effort in the world that stresses progressive scan and square pixels. If the Commission were to delay adoption of the Advisory Committee recommendation out of a concern with interlaced scanning, it would

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[60]*See Advisory Committee Final Report and Recommendation,* FCC Advisory Committee on Advanced Television Service, November 28, 1995, at 15-16. "A critical aspect . . . is the availability of progressive scanning and square pixels . . . However, interlaced scanning also is important . . . there are advantages to both . . . there is no evidence in the Advisory Committee's record that would justify dropping either format at this time . . . The U.S. approach wisely incorporates the best of *both* scanning formats." (emphasis in original)

only serve to entrench interlaced scanning as the predominant mode for digital television throughout the world.

Regardless of the technical arguments about the acceptability of interlaced formats for certain classes of applications, continued insistence on *banning* interlaced formats is unwarranted and self-serving.[61] The ATV standard recommended by the Advisory Committee contains numerous progressive scan and square pixel formats to support the applications that benefit from those attributes.[62] Neither program producers, broadcasters, nor consumers will be forced to *use* an interlaced format simply because it exists in the standard. If judged superior by the marketplace, the use of progressive scan formats will surely proliferate. Indeed, the members of the Grand Alliance who manufacture televisions already plan to include progressive scan receivers in their initial ATV product offerings.[63]

Apple (at 7), Microsoft (at 5), and CICATS (at 4) also complain about the 60 Hz transmission rate, again confusing transmission formats with display formats. For example, Apple states ". . . the proposed *transmission rate* of 60 Hz is of particular concern. A 60 Hz *display rate* has not proven to be sufficient for the display of text and fine graphic information with the resolution expected by computer users." (emphasis added)

These complaints are meritless. First, the majority of prime time programming is currently produced in 24 frame per second film, a practice that will continue with HDTV. With the Grand Alliance system, such material will be broadcast at its native 24 Hz frame rate (rather than be converted to a 60 Hz transmission as is required with NTSC), and can easily be displayed at 72 Hz (three times the 24 Hz transmission rate). Second, flicker is also not a

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[61]MIT endorses this statement only with respect to the HDTV ATV formats. Although MIT supports all six Grand Alliance HDTV formats, MIT has opposed the inclusion of interlaced formats for SDTV in the ATV standard.

[62]As Chairman Wiley noted in his *En Banc* Hearing testimony (at 2), "Fortunately, the Grand Alliance technology is flexible enough to incorporate both scanning modes in the standard (at minimal additional cost). There was overwhelming consensus for this approach, which reasonably meets the needs of all affected parties. Conversely, there was absolutely no record of support for dropping either mode." (emphasis in original)

[63]Thus, the remarkable conclusion of CICATS (at 3) "that the perpetuation of antiquated interlace technology only serves to build a competitive advantage for television manufacturers" is nonsense.

problem for non-film sources. No one claims that a 60 Hz display rate causes problems for motion video, and for still pictures the screen can easily be refreshed at any higher rate desired, with only modest additional cost added to the receiver. Third, for non-film, motion-video sources, increasing the transmission frame rate higher than 60 Hz would have to come at the expense of either reduced spatial resolution or increased compression artifacts -- both undesirable options -- in order to continue to fit the coded signals within a 6 MHz terrestrial channel. Fourth, for motion video programs transmitted at 60 Hz, computers or televisions used in computing applications could convert the received 60 Hz signals into 72 Hz display rates employing the same frame rate conversion techniques commonly used to convert 50 Hz television used elsewhere around the world to 60 Hz NTSC used in the U.S. and Japan. And finally, in all events the Commission should not regulate the features of displays, as the computer industry has long held.[64]

The Commission's overriding goal in this proceeding is to preserve and enhance free over-the-air television service, including the adoption of policies that will allow digital television infrastructure and applications to contribute to improving the NII. Contrary to the implicit assumption of some members of the computer industry, the Commission's goal *is* not and *should* not be to make the most computer-friendly, interoperable entertainment/NII appliance ever developed indistinguishable from a personal computer. Moreover, it takes a lot of gall for Microsoft and Apple to lecture on computer compatibility and interoperability, as anyone who has tried to share a Microsoft/IBM-compatible document with an Apple

[64]Apple (at 7), Microsoft (at 5) and CICATS (at 3) also express concern that the Advisory Committee recommendation does not specify a specific protocol to provide error-free data delivery using the data delivery capabilities of the system. These concerns are misplaced. Many additional industry standards will need to be developed in the coming months and years to take increasing advantage of the flexibility of the Grand Alliance system for data delivery and other applications. For example, ATSC has already adopted two voluntary standards for conveying system information and program guide information that go beyond the main digital television standard recommended to the Commission by its Advisory Committee. Moreover, ATSC welcomes new members with an interest in ATV and is currently reviewing the need for supplemental ATV standards. There is no need for the Commission to specify these protocols as part of its ATV transmission standard.

Macintosh user knows.[65] "And why beholdest thou the mote that is in thy brother's eye, but considerest not the beam that is in thine own eye?" (Jesus -- Sermon on the Mount)

Cable Interoperability

Tele-Communications, Inc. ("TCI") (at 24-27) urges the Commission not to adopt a standard for SDTV terrestrial broadcasting, fearing that such a standard could effectively become an SDTV standard for cable and other providers of multiple video programs. If the Commission nevertheless adopts a broadcast SDTV standard, TCI encourages the Commission to require that it conform to the MPEG-2, "Main Level, Simple Profile" ("MPEG-2 MLSP") specification, i.e., the use of bi-directionally predicted frames ("B frames") should be precluded. TCI argues that B frame motion coding requires the use of additional memory chips that will add an additional $50 to $60 to a cable operator's costs for each digital cable set-top terminal.

We believe the Commission should not preclude the use of B frames in a broadcast SDTV standard. In the case of HDTV, at least, a technical investigation within the Grand Alliance in 1993 proved that B frames offered perceptible improvements in coding performance. More important, even if the Commission agreed with TCI's recommendation, it would have no impact on the hardware employed in ATV receivers. The overwhelming consensus that all-format ATV receivers will be required by the marketplace, even if not mandated by the Commission, means that sufficient memory to decode HDTV will be included in all ATV receivers. This amount of memory will be more than adequate to decode all SDTV formats, whatever the MPEG-2 level or profile.[66]

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[65]Alone among more than 200 commenters, Microsoft (at 6) makes the remarkable statement that "Given the expansion of video alternatives, the Commission's goal of preserving 'free over the air services' would seem to be an out-moded policy goal . . ."

[66]It should also be noted that a compliant Main Level MPEG decoder will also decode Simple Profile bit streams.

Thus, the Commission should not modify the Advisory Committee's ATV recommendation as it relates to SDTV standards for digital broadcast television by precluding the use of B frames.

XIII. The Commission should modify its approach as necessary to promote the conversion of noncommercial stations to ATV.

In addition to responding to the policy issues raised generally in the Commission's Notice, Public Television (at 10-13) describes a creative legislative proposal currently before Congress that would establish a Public Broadcasting Fund that would replace the present system of Federal appropriations with a new funding source for both the conversion of noncommercial television stations to ATV and ongoing public broadcasting operations. In their comments, Public Television urges the Commission to adopt a number of modifications to meet the special needs created by their proposed funding plan.

Throughout the eight-year ATV process public broadcasters have been active contributors to the development and testing of digital television. Their actions in the industry and their comments in this proceeding demonstrate a clear commitment to upgrading their broadcast service to digital ATV as rapidly as possible, with HDTV as the centerpiece application. Their comments (at 4-8) articulate an impressive vision of the value HDTV will bring to their producers and viewers, and at the same time they have well-developed plans for additional uses of the ATV spectrum, including the use of multicast SDTV in support of their lifelong learning programs. In light of this vision for ATV that is clearly in harmony with the Commission's principal objective in this proceeding, the Commission should give great weight to their proposals for modifying the Commission's approach where necessary to meet their needs.

Whether Public Television's creative plan for financing the conversion to ATV and the ongoing operation of public television is an appropriate use of the spectrum is a matter for the Congress to decide. After all, by the end of the transition it amounts to assigning each

noncommercial television broadcaster an ATV channel and selling a second 6 MHz channel that otherwise would be part of the spectrum recovered by the Commission for other purposes. If Congress adopts the proposal, the Commission should modify its policies as appropriate to promote the rapid conversion of noncommercial television broadcasting to ATV. We offer the following comments on Public Television's proposals, subject to Congressional approval of their proposal.

The Grand Alliance does not oppose separate NTSC and ATV licenses for noncommercial broadcasters, nor do we oppose exempting ATV channels shared by multiple noncommercial broadcasters from simulcasting requirements. We raise no objection to the proposal for less demanding ATV construction schedules for noncommercial broadcasters as long as they are operating their ATV channel by the end of the transition period, and we endorse giving them the option to convert to full-time ATV on their NTSC channels at any time during the transition period.

We are concerned with their proposal to waive liberally the minimum HDTV requirements, especially for those broadcasters sharing an ATV channel. (Public Television Comments at 20) We see no valid reason why a different policy needs to be followed for noncommercial broadcasters. In the case of a shared ATV facility, the broadcasters sharing that facility should collectively be obligated to transmit the minimum number of hours of HDTV. Since many of the most popular public television programs are most likely to be produced in HDTV and shown by PBS affiliates nationwide, minimum HDTV requirements would not seem to impose much of a constraint on noncommercial broadcasters.

As previously mentioned, we are also troubled by Public Television's proposal (at 21, fn. 34) that the Commission would assume that revenue-generating ancillary services did not interfere with the broadcast use of the spectrum as long as one SDTV or HDTV broadcast service were offered during normal operating hours. Such a standard falls well short of the commitment to predominant use for free over-the-air television with HDTV as the centerpiece